

CLAIMS

What is claimed is:

1        1. A method of virtually addressing a plurality of storage devices through a  
2 switch, including the steps:

3                establishing a file session between a client and the switch, wherein the switch  
4 appears as a virtual storage device;

5                selecting in the switch one of a plurality of storage devices coupled with the  
6 switch to participate in the file session; and

7                programming logic in the switch to forward packets in the file session to the  
8 selected storage device.

1        2. The method of claim 1, wherein the client having TCP logic to participate  
2 in a file session recognizes the switch as a virtual storage device without modification of  
3 the TCP logic.

1        3. The method of claim 1, wherein the virtual storage device conforms to a  
2 SCSI over IP protocol.

1        4. The method of claim 1, wherein the virtual storage device conforms to a  
2 NAS disk protocol.

1        5. The method of claim 1, wherein the virtual storage device conforms to a  
2 NASD disk protocol.

1        6. The method of claim 1, wherein selecting one of a plurality of storage  
2 devices includes inspecting data transmitted with a file session packet and selecting the  
3 storage device responsive to said data.

1        7.        The method of claim 1, wherein the switch includes a file directory and  
2 selecting one of a plurality of storage devices includes inspecting data transmitted with a  
3 file session packet and accessing the file directory to select the storage device responsive  
4 to said data.

1        8.        The method of claim 1, wherein the switch includes a file directory and  
2 selecting one of a plurality of storage devices includes inspecting data transmitted with a  
3 file session packet and accessing the file directory to select the storage device hosting a  
4 file responsive the said data.

1        9.        The method of claim 1, wherein the switch includes a file directory and  
2 selecting one of a plurality of storage devices includes inspecting data transmitted with a  
3 file session packet and accessing the file directory to select the storage device having  
4 characteristics responsive to said data.

1        10.       The method of claim 1, further including the steps:

2                determining in the selected storage device to redirect the file session to an other  
3 device;

4                handing off the file session to an other storage device; and

5                reprogramming the switch to forward packets in the file session to the other  
6 storage device.

1        11.       The method of claim 1, wherein handing off the file session and  
2 reprogramming the switch are transparent to the client.

1        12.       The method of claim 1, wherein at least one of the plurality of storage  
2 devices coupled with the switch is an other switch configured to appear as a virtual

3 storage device.

1           13.    A method of addressing a plurality of storage devices connected to a  
2 network as a single virtual storage device, including the steps:

3           inserting a switch between the storage devices and the network, wherein the  
4 switch appears as a virtual storage device;

5           accepting in the switch a request to establish a file session between a client and the  
6 switch;

7           selecting in the switch one of a plurality of storage devices attached to the switch  
8 to participate in the file session; and

9           programming the switch to forward packets in the file session to the selected  
10 storage device.

1           14.    The method of claim 13, wherein the client having logic to participate in a  
2 file session recognizes the switch as a virtual storage device without modification of the  
3 client logic.

1           15.    The method of claim 13, wherein the virtual storage device conforms to a  
2 SCSI over IP protocol.

1           16.    The method of claim 13, wherein the virtual storage device conforms to a  
2 NAS disk protocol.

1           17.    The method of claim 13, wherein the virtual storage device conforms to a  
2 NASD disk protocol.

1           18.    The method of claim 13, wherein selecting one of a plurality of storage

2 devices includes inspecting data transmitted with a file session packet and selecting the  
3 storage device responsive to said data.

1 19. The method of claim 13, wherein the switch includes a file directory and  
2 selecting one of a plurality of storage devices includes inspecting data transmitted with a  
3 file session packet and accessing the file directory to select the storage device responsive  
4 to said data.

1 20. The method of claim 13, wherein the switch includes a file directory and  
2 selecting one of a plurality of storage devices includes inspecting data transmitted with a  
3 file session packet and accessing the file directory to select the storage device hosting a  
4 file responsive the said data.

1 21. The method of claim 13, wherein the switch includes a file directory and  
2 selecting one of a plurality of storage devices includes inspecting data transmitted with a  
3 file session packet and accessing the file directory to select the storage device having  
4 characteristics responsive to said data.

1 22. The method of claim 13, further including the steps:

2 determining in the selected storage device to redirect the file session to an other  
3 device;

4 handing off the file session to an other storage device; and

5 reprogramming the switch to forward packets in the file session to the other  
6 storage device.

1 23. The method of claim 13, wherein handing off the file session and  
2 reprogramming the switch are transparent to the client.

1           24. The method of claim 13, wherein at least one of the plurality of storage  
2 devices attached to the switch is an other switch configured to appear as a virtual storage  
3 device.

1           25. A switch supporting virtual addressing a plurality of storage devices,  
2 including:

3           a storage medium; and

4           a processor connected to the storage medium,

5           the storage medium storing

6           a program for controlling the processor; and  
7           the processor operative with the program to

8           establish a file session between a client and the switch, wherein the  
9           switch appears as a virtual storage device;

10           select one of a plurality of storage devices attached to the switch to  
11           participate in the file session and store an address corresponding to  
12           the selected storage device; and

13           forward packets in the file session to the selected storage device  
14           based on the stored address.

1           26. The device of claim 25, wherein the client includes logic to participate in a  
2           file session and the program is operative to appear to the client logic as a virtual storage  
3           device without modification of the client logic.

1           27. The device of claim 25, wherein the virtual storage device conforms to a  
2           SCSI over IP protocol.

1           28.    The device of claim 25, wherein the virtual storage device conforms to a  
2    NAS disk protocol.

1           29.    The device of claim 25, wherein the virtual storage device conforms to a  
2    NASD disk protocol.

1           30.    The device of claim 25, wherein selecting one of a plurality of storage  
2    devices includes inspecting data transmitted with a file session packet and selecting the  
3    storage device responsive to said data.

1           31.    The device of claim 25, wherein the storage medium stores a file directory  
2    and the program is operative to inspect data transmitted with a file session packet, access  
3    the file directory and select the storage device responsive to said data.

1           32.    The device of claim 25, wherein the storage medium stores a file directory  
2    and the program is operative to inspect data transmitted with a file session packet, access  
3    the file directory and select the storage device hosting a file responsive the said data.

1           33.    The device of claim 25, wherein the storage medium stores a file directory  
2    and the program is operative to inspect data transmitted with a file session packet, access  
3    the file directory and select the storage device having characteristics responsive to said  
4    data.

1           34.    A method of fail-over from a first storage device involved in a file session  
2    to a second storage device, including the steps:

3           predicting in a switch coupled to a first storage device that the failure of the first  
4    storage device will require a fail over;

5           selecting a second storage device to which to redirect the file session;

6 handing off the file session to the second storage device; and

7 reprogramming the switch to forward packets in the file session to the second  
8 storage device.

1 35. The method of claim 34, wherein handing off the file session and  
2 reprogramming the switch are transparent to a client involved in the file session.

1 36. The method of claim 34, wherein the switch comprises one or more input  
2 processors, logic to process packets, switch fabric, a forwarding table and one or more  
3 output processors.

1 37. The method of claim 36, wherein handing off the file session and  
2 reprogramming the switch are transparent to a client involved in the file session.

1 38. The method of claim 36, wherein the switch appears to a client as a virtual  
2 storage device conforming to a SCSI over IP protocol.

1 39. The method of claim 36, wherein the switch appears to a client as a virtual  
2 storage device conforming to a NAS disk protocol.

1 40. The method of claim 36, wherein the switch appears to a client as a virtual  
2 storage device conforming to a NASD disk protocol.

1 41. A method of fail-over from a first storage device involved in a file session  
2 to a second storage device, including the steps:

3 determining in a switch coupled to a first storage device that the failure of the first  
4 storage device requires a fail over;

5 selecting a second storage device to which to redirect the file session;

6 handing off the file session to the second storage device; and

7 reprogramming the switch to forward packets in the file session to the second  
8 storage device.

1 42. The method of claim 41, wherein handing off the file session and  
2 reprogramming the switch are transparent to a client involved in the file session.

1 43. The method of claim 41, wherein the switch comprises one or more input  
2 processors, logic to process packets, switch fabric, a forwarding table and one or more  
3 output processors.

1 44. The method of claim 43, wherein handing off the file session and  
2 reprogramming the switch are transparent to a client involved in the file session.

1 45. The method of claim 43, wherein the switch appears to a client as a virtual  
2 storage device conforming to a SCSI over IP protocol.

1 46. The method of claim 43, wherein the switch appears to a client as a virtual  
2 storage device conforming to a NAS disk protocol.

1 47. The method of claim 43, wherein the switch appears to a client as a virtual  
2 storage device conforming to a NASD disk protocol.

1 48. A method of load balancing between a first device and an other device  
2 coupled to a switch, including the steps:

3 determining in a first device coupled to a switch that the work load of the first  
4 device warrants a session transfer;

5 selecting an other device to which to transfer the session;

6 handing off the session to the other device; and

7 reprogramming the switch to forward packets in the session to the other device.

1 49. The method of claim 48, wherein handing off the session and  
2 reprogramming the switch are transparent to a client coupled to the switch.

1 50. The method of claim 48, wherein the switch comprises one or more input  
2 processors, logic to process packets, switch fabric, a forwarding table and one or more  
3 output processors.

1 51. The method of claim 50, wherein handing off the file session and  
2 reprogramming the switch are transparent to a client coupled to the switch.

1 52. A method of load balancing between a first device and an other device  
2 coupled to a switch, including the steps:

3 determining in a switch coupled to a first device that the work load of the first  
4 device warrants a session transfer;

5 selecting an other device to which to transfer the session;

6 handing off the session to the other device; and

7 reprogramming the switch to forward packets in the session to the other device.

1 53. The method of claim 52, wherein handing off the session and  
2 reprogramming the switch are transparent to a client.

1 54. The method of claim 52, wherein the switch comprises one or more input  
2 processors, logic to process packets, switch fabric, a forwarding table and one or more

3 output processors.

1 55. The method of claim 54, wherein handing off the session and  
2 reprogramming the switch are transparent to the client.

1 56. A method of load balancing between a first switch involved in a file  
2 session to a second switch, the first and second switches being connected to a plurality of  
3 storage devices, including the steps:

4 determining in a first switch coupled to a second switch that a file session  
5 involving the first switch should be handled by the second switch;

6 handing off the file session to the second switch; and

7 reprogramming the first switch to forward packets in the file session to the second  
8 switch.

1 57. The method of claim 56, wherein handing off the file session and  
2 reprogramming the first switch are transparent to a client involved in the file session.

1 58. The method of claim 56, wherein the first and second switches comprise  
2 one or more input processors, logic to process packets, switch fabric, a forwarding table  
3 and one or more output processors.

1 59. The method of claim 58, wherein handing off the file session and  
2 reprogramming the first switch are transparent to a client involved in the file session.

1 60. The method of claim 58, wherein the first switch appears to a client as a  
2 virtual storage device conforming to a SCSI over IP protocol.

1 61. The method of claim 58, wherein the first switch appears to a client as a

2 virtual storage device conforming to a NAS disk protocol.

1 62. The method of claim 58, wherein the first switch appears to a client as a  
2 virtual storage device conforming to a NASD disk protocol.